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Research in Army Training: Present and Future

by

Meredith P. Crawford

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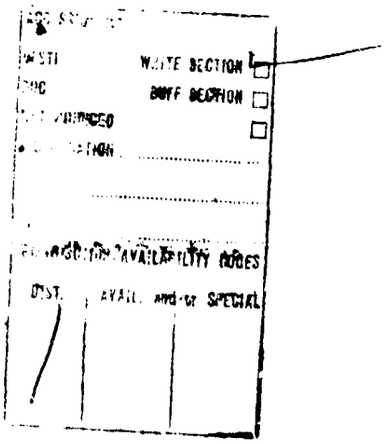

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Prefatory Note

This paper, a presentation to the U.S. Army Infantry Conference held at the Infantry Center, Fort Benning, Georgia, in December 1958, was given by Dr. Crawford, Director of the Human Resources Research Office. Papers and discussions at the Conference dealt with the doctrine, organization, materiel, and tactics of war.

Because of the continuing relevance of the subject matter of the paper, it is being issued as part of the HumRRO Professional Paper series. This series was initiated in order to provide permanent record of specialized aspects of HumRRO work, and deposit in the scientific and technical information storage and retrieval systems of the Department of Defense and the Federal Clearinghouse.

RESEARCH IN ARMY TRAINING: PRESENT AND FUTURE

Meredith P. Crawford
Director, Human Resources Research Office

RESEARCH ON INFANTRY TRAINING

The role of the ground soldier, especially the infantryman, has never been as important as it is today. As we consider the prospect for armed conflict of any kind, be it limited war or global atomic struggle, the infantryman will be required to apply force in a discriminating manner to defend friendly terrain, to seize and hold enemy terrain. Unless enemy terrain can be seized and held, there is likely to be no clear-cut decision, whatever the size of the engagement. The ground combat soldier will have to go in early, and he will have to stay, and he will have to be reinforced and replaced by others like him, depending on the length of the conflict.

What kind of man will he have to be? He will have to shoot conventional-type weapons and new specialized weapons. He will have to fight in any climate—desert, arctic, jungle, or temperate. He will have to move rapidly and travel lightly—perhaps even live off the land, as he may outrun normal supply lines. He will have to live and fight in small groups where leadership will be important, direct, and personal.

This man will require training—good training designed to teach him what he will have to *know* and what he will have to *do*, and hard training so that he can prove to himself that he "does know" and "can do." The training that we have had in the past has gotten us by—we have won wars and preserved our way of life. The training we have now is headed in the right direction, but it is lacking in two respects.

First, the soldiers aren't learning all that they should. Research workers and military men in the Human Resources Research Office have made many objective measurements of soldier proficiency in common military skills. Not once have our tests shown that the trainees had mastered as much training as the officers thought they should. This has been true for the large samples of men trained in light weapons infantry and basic armor. The fact is that our training must accomplish more. The valuable training time must yield higher dividends in soldier learning.

Second, the training must be more clearly pointed toward the requirements of the future: The soldier must learn to handle new weapons, must have an all-climate and all-terrain capability, and must be relatively self-sufficient in terms of logistics, communication,

and leadership. This new training must have a content different from the old and from the present.

These two current deficiencies may be expressed in the classical questions of training and education—"how to teach" and "what to teach." Some research techniques are already available for the solution of both problems.

By way of illustration, let me summarize briefly how these two questions were answered in the HumRRO research that led to the TRAINFIRE I program described by another speaker. The question of "what to teach" was answered by a careful examination of the combat rifleman's job in terms, for example, of the types of targets he would encounter, their ranges, the firing positions he would be likely to use, all drawn from combat records and interviews with experienced combat personnel. These job characteristics became the *premises*.

The "how to teach" in TRAINFIRE was devised from many sources. Some psychological principles came into play, such as one dealing with immediate knowledge of results, which enables the learner to correct his mistakes as soon as they are made, thus maintaining his motivation. Some new hardware was developed, such as the "Punchy Pete" target that supplies this knowledge of results in a realistic manner. Some commonsense application was made of proven military training practices, such as concurrent training that makes profitable and interesting use of otherwise idle time. Ingredients like these were mixed in pilot experimentation and combined into a workable training package.

This training was then objectively tested on realistic problem ranges combining ability to shoot accurately with ability to detect targets. Comparison was made between experimental and control groups under adequate conditions of reliable testing to measure the effectiveness of the new training, both by the researchers and later by the Army in the troop tests.

TRAINFIRE I is an example of the sort of thing that training research can accomplish. The research was limited to one skill, an elementary but important one, to be sure. Larger blocks of instruction are currently under study here at Fort Benning. Research under BASIC-TRAIN is concerned with a detailed specification of the content of Basic Combat Training, with the development of improved proficiency tests, and with the experimental trial of new methods of training and management of training. The broad objectives of the research are to provide a new method of basic training that will turn out a new recruit with increased physical capacity, fundamental knowledge of the primary hand-held weapons, and most important, with a positive attitude and readiness to learn the knowledges and skills of his assigned military occupational speciality.

In Work Unit RIFLEMAN, the research is directed at the requirements of the infantry soldier in the 1962-65 period. A careful analysis is first being made of the knowledges and skills that will be required of him in weapons, communications, transportation, and individual and squad tactics in the future period. Training techniques, including

realistic equipment to aid in training or testing, are also being developed. The new program will then be experimentally tested.

In both of these research efforts the problems of moving and fighting in conditions of limited visibility will be studied. Based on capabilities and limitations of the human eye and ear as determined through research, new training techniques to maximize the soldier's capabilities or compensate for his limitations, will be developed and incorporated into the large developmental studies, BASICTRAIN and RIFLEMAN.

PURPOSES AND METHODS OF CURRENT TRAINING RESEARCH

So far I have spoken of research that has been completed or is under way here in support of Infantry training; I will now talk in somewhat more general terms about the purposes and methods of training research throughout HumRRO, in Washington, and at our Divisions at Fort Knox, Kentucky; Fort Rucker, Alabama; Fort Bliss, Texas, and the Presidio of Monterey, California.

The primary objective of training research is to increase the proficiency of the graduates of training programs. Two other objectives are also sought—reduction in time and reduction in cost. In research on certain school courses, it has been possible to meet all three objectives at the same time. In others, primary attention was given to only one. For example, a preliminary study at Fort Ord indicated that it is possible to reduce the time required in Basic Combat Training from eight to four weeks with men in the upper one-third o the aptitude scale and yet gain the same proficiency. Reduction in training time generally results in overall cost reduction, although, in some cases, gains in time and proficiency may result in somewhat higher unit costs. The choice between the three objectives of increased proficiency, reduced training time, and reduced costs, depends on many factors. In no event can proficiency be sacrificed, but the problem may be one of attaining the same proficiency in shorter time or at less cost. In times of mobilization, reduction in time is more important than reduction in costs.

I will outline the methods that are currently in use in training research in order to point up certain problems that research on future Army training will have to solve. The resumé given above of the TRAINFIRE I research suggested a certain sequence of study that has also proven to be of great use in research on training in Armor, Anti-aircraft Artillery, and certain technical specialties. The sequence may be summarized in four steps:

(1) Analysis of the military skill or job. We must begin by studying the man on the job to obtain a careful description of what he does and how he does it. This requires an analysis of the system of tactics and weapons in which he operates. In doing research on current military jobs, it is relatively easy to carefully observe the soldier, to review combat records, and to analyze the system in which he operates. In common Army terms, we attempt to determine the "need to know" and

the "nice to know" items of knowledge and skill for the job. This may, and often does, constitute a major effort in the training research task, involving detailed records of a soldier's activity, interviews with combat veterans, and comprehensive study of Army training manuals and tactical literature. At the end, this work results in a comprehensive statement of the objectives of training on which researchers and the Army can agree.

(2) Construction of the proficiency measure. The next step is to put this realistic job description in the form of a test—a test that will measure how well the man can perform the necessary skills, or whether he has the specified knowledge. This objective measurement of proficiency with reliable tests, derived from a clear statement of the job requirements, is the key to training research. Again, it is on this proficiency test that the researchers and the military officers can agree that the training objectives have been correctly specified, in a measure that will indicate degrees of individual competence and skill.

(3) Development of new training procedures. While this test development is going on, a new training procedure is developed. As indicated in the TRAINFIRE research, certain psychological principles are combined with Army experience to achieve clarity and simplicity of presentation, timely use of training aids, and opportunity for practice. Realism is stressed, with orderly presentation of topics, calculated to maintain the student's interest and motivation to learn. This new program may be designed to be shorter, or more comprehensive, or more economical than the standard, depending on the particular military requirement of the research task.

(4) Experimental test of new training against proficiency measure. Finally, as a fourth step, an experiment is performed. In the simplest case, two equivalent groups of soldiers are used, one trained on the standard program (control group) and one on the new program (experimental group). These groups are measured on the test. This test may come at the end of training, to measure training effects, or it may come after some job experience to measure what some have called the "growth potential" that results from the experimental training. The results of this comparison will be interpreted in terms of the objective of the research. If the experimental program was shorter than the old, control program, equivalence of the performance on the test is an acceptable result. If the experimental and control programs are equivalent in time and cost, then the former would have to prove its superiority in terms of increased proficiency on the test.

The effectiveness of these procedures can be illustrated with two examples of completed research outside the field of Infantry, one in Armor and one in electronics training. One illustrates a possible saving in time.

At Fort Knox HumRRO researchers have been working for some time on the Advanced Individual Training program for the tank crewman. Extensive study was given to the job requirements by observing tank crewmen in CONUS and Europe and by studying combat records and training manuals.

There was an indication of a need for improved training after a series of proficiency tests was devised, and an assessment of the state of Armor training in various types of units was made. A new program of training was then developed, based on studies of the optimal distribution of the "learning time" required for each of 40 subjects. New instructional aids in the form of picture training guides were developed, and other improvements were made in instructional methods and gunnery tables. The new program was administered in six weeks instead of eight, a 25% reduction in time. The results of the final test are shown in Figure 1.

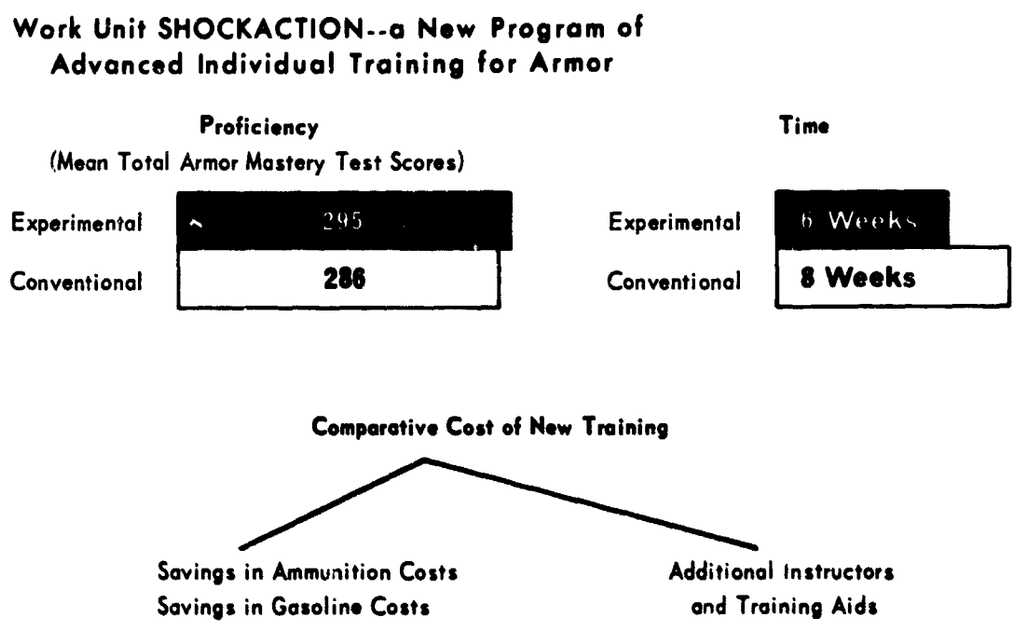

Figure 1

The bars show the slight increase in proficiency (total score rise from 286 to 295) and the reduction in time, from eight to six weeks. The costs of the new training are suggested in the lower part of the figure. In this experiment equivalent proficiency was obtained in shorter time. The Armored Center is studying these research results to determine a position to present to USCONARC.

In the area of electronics training, we completed, under Work Unit RADAR, a group of studies concentrated on the M33 Fire Control maintenance man. On the basis of an analysis of the M33 technician's field activities, a performance proficiency test was developed and administered to men whose experience varied widely, from fledgling operators recently graduated from the Air Defense School, to men who had been on the M33 job for periods up to four years.

The results, shown in Figure 2, indicate that the test is a good one. That is, the test differentiated not only between inexperienced and experienced mechanics, but also among men with varying levels of experience. To put it another way, the test measured not only how much potential M33 mechanics learn in school, but also how much they learn on the job. The broken line indicates the level of performance that officers in the field thought to be satisfactory.

This same test was used in a later phase of the RADAR research to evaluate the effectiveness of a new M33 technician training program developed by HumRRO. This program featured the addition of some operator training to give students a picture of the radar set as a whole, and a maintenance subcourse to provide intensive review, on equipment, of troubleshooting and field adjustments. The amount of

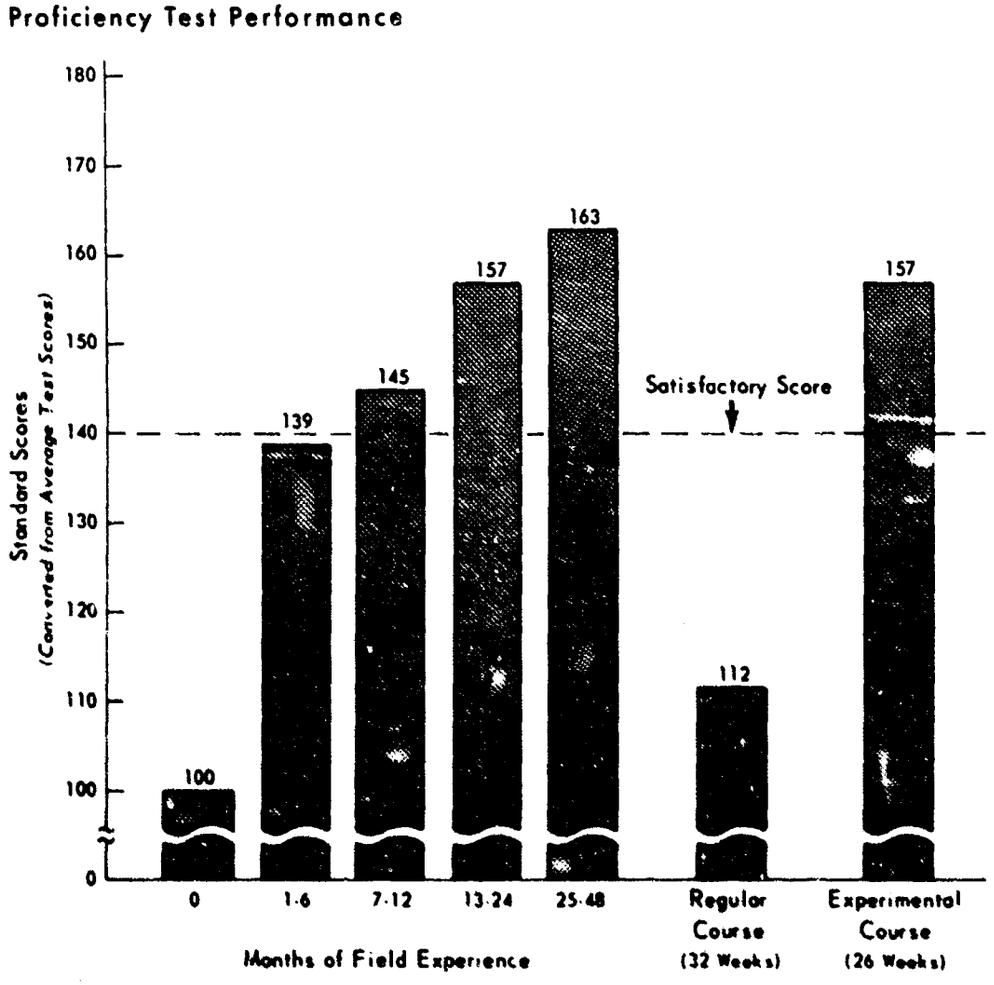

Figure 2

time devoted to basic electronics was cut by half. Overall, the new training was shorter than the standard training by six weeks.

Figure 2 also indicates the results of an experiment comparing the new experimental training program with a new control group in the regular course; it gives the results of the regular course of 32 weeks and the experimental course of 26 weeks. The regular course had shown some improvement since the test was standardized. Despite the fact that the training course developed by HumRRO was shorter, the average proficiency achieved by men trained in this program was considerably greater than that achieved by trainees in the regular course. The proficiency of the experimentally trained technicians was like that achieved on the earlier testing by mechanics who had been on the job from 13 to 24 months. To be conservative, since there had apparently been some improvement in the basic course itself, we can say that graduates of the new program did as well as normally trained mechanics with up to one year of experience.

In sum, we have effected in this research a significant increase in proficiency while at the same time reducing the time, and the cost, of training.

TRAINING RESEARCH FOR THE ARMY OF THE FUTURE

I have presented a workable and successful procedure for conducting research on current Army training. What about training for the new skills and knowledges that will be required in the future, using weapons and tactics that are still being designed and developed? It is clear that unless training procedures are ready by the time new weapons are delivered to troops, the realization of the potential increase in Army capability will be seriously delayed. The effectiveness of the new weapons system depends on the effectiveness of each part of the system—the weapons, the tactics, and the men. The problems involved in anticipating the future pose three specific questions for us in the planning of HumRRO research:

(1) On what future weapons systems should research be undertaken?
(2) Toward what time frame should the research be projected?
(3) What method of research is applicable when the subject training or military operation does not presently exist?

The first question on future weapons systems is perhaps the easiest to answer. The guidance of the Combat Developments Operation Guide (CDOG) is available and the plans of the Chief of Research and Development indicate what new weapons, vehicles, and communications equipment are coming along. In addition, planning for tactics going on in the Combat Developments Program and the testing of these new concepts at the Combat Developments Experimentation Center (CDEC) offer guidance on new systems. The findings of this Conference will also be useful. Training research will be directed to those new MOSs and systems where it appears that the training will be most difficult or where it will differ most from current training. Emphasis will be given to research

on combined arms in view of the anticipated concentration of weapons of all the combat arms in the small unit of the PENTOMIC Army.

Concerning the second question, the choice of the appropriate time frame would be easy if we could predict the future course of international relations. Earlier presentations in this Conference have dealt with the possibilities of cold, limited, unrestricted war. Without reviewing these discussions, we can make at least the most conservative assumption—that we must be prepared for limited war.

The third problem, posed earlier, concerns an appropriate method for training research in the future, since we cannot observe, as we do now, the actual military performance. Again, the method is deductive, employing the skill and experience of the military officer. Our problem is to specify, in quantifiable proficiency measurement terms, an acceptable standard of individual or unit performance in, for example, the new PENTOMIC concept. We need a measured proficiency standard against which to develop new training procedures in much the same manner as we use proficiency measures in research on current training. The difference is that for current training problems, we have a standard training course against which to compare the new training. For future training, when none now exists, an arbitrary standard will have to be developed, calling for the best military judgment of experienced officers, aided by research methods.

As an illustration, I will cite a small beginning on this problem that we have made at Fort Benning in research on Work Unit PATROL. In this research we are attempting to develop training procedures for individual land navigation skills for the future Army. We ask specific questions: "What will be the requirements for land navigation of the individual soldier in the ROCID Division operating anywhere in the world? Over what kind of terrain will he have to go, how far, and with what, if any, road nets?" Using the latest concepts of the deployment of the ROCID Division, military advice was sought in laying out possible intracompany movements, intercompany movements, and movements outside the battle group, as they might be deduced from a hypothetical deployment. The distances and the desired timing were specified by military advisers. From this information, a proficiency test was developed, and training was designed to meet this specification.

Thus, by deductive procedures, a framework can be built into the future. Additional problems arise, however, in specifying the acceptable level of proficiency. What, for example, is an acceptable range of performance for a group of soldiers? Can we get a representative measure during training? We are now studying these kinds of problems in methods, so that we may advance in training research for an Army employing new tactics as well as new weapons.

So far, I have attempted to show the method of application of research procedures to current Army training and to illustrate the usefulness of these techniques. I have also outlined three major problems encountered in training research for the future Army. In

closing, I wish to suggest certain topics for further consideration in the Committee 10[1] meetings:

(1) The importance of objective proficiency measurement not only in training research, but as a constant check on Army training.

(2) The need to develop a method of translating the combat experience of qualified officers from the past to the future, so that acceptable proficiency standards may be set as future training goals.

(3) The importance of careful systems analysis of the new battlefield concepts from which to deduce precise training requirements.

(4) Guidance for training research along lines of future importance that have not yet been explored.

[1]Ed. Note—The Conference was divided into 11 Committees for the preparation of recommendations; members of Committee 10 discussed the topic of "Training Research."

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13. ABSTRACT

This paper shows the method of application of proven research procedures to Army training and illustrates the usefulness of research techniques in making training more effective and efficient. Objective measurements of soldier proficiency in common military skills and knowledges are described.

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